PP53.

Hemodynamic Influences on Abdominal Aortic Aneurysm Wall Composition

Rob Hurks[1], Imo E Hoefer[1], Joost A van Herwaarden[1], Aryan Vink[1], Jean-Paul PM de Vries[2], Gerard Pasterkamp[1], Frans L Moll[1]. [1]University Medical Center Utrecht, Utrecht, Netherlands; [2]St Antonius Hospital, Nieuwegein, Netherlands

Objective: Current Abdominal Aortic Aneurysm (AAA) research focuses on either wall composition or hemodynamics. Human data on combining both topics is lacking. Endovascular (EVAR) treatment separates the aneurysm from the modulating hemodynamic forces and thus allows studying their effects on aneurysm wall composition. Therefore, we compared aneurysm wall composition of EVAR treated patients after redo open surgery and of primarily open repaired AAA.

Methods: Patients undergoing elective open AAA repair, either primary (n=60) or endovascular (EVAR)-redo due to type 2 endoleaks (n=6), were included and matched for diameter. Pre-operatively, patients filled in an extensive questionnaire and during surgery a specimen of the ventral AAA-wall was collected and freshly frozen to study cytokine levels. Part of the wall was used for histology to assess elastin, collagen and inflammatory infiltrate.

Results: Baseline characteristics showed no differences in gender, age, other risk factors of AAA development and medical history. Aneurysm wall of the EVAR-redo patients contained more smooth muscle cells (p=0.013), more collagen in the intima and media (p=0.010), both consistent with a more robust type of AAA-wall being less prone to rupture. No differences in elastin content were found. Histological analysis of inflammatory infiltrates revealed that EVAR-redo AAA contained more lymphocytes in the intima and media (p=0.001) and more macrophages in the media (p=0.004) compared to primary open repair AAA. However, these inflammatory cells are by far outnumbered by the number of inflammatory cells in the adventitia, which did not differ between groups suggesting that absolute numbers do not differ significantly. This is supported by the lack of difference in levels of iL1beta, iL2, iL4, iL5, iL6, iL8, iL10, iL12p70, TNFalpha, TNFbeta and IFNgamma.

Conclusions: Our results indicate that the isolation of the aneurysm from the molding hemodynamic forces by EVAR treatment stabilizes AAA walls. These findings raise the question of shifting the 5mm diameter increase in 6 months cut-off point as sole indication for conversion of EVAR-treated AAA with type 2 endoleaks and await evolution. Further research is needed to confirm these findings.

Author Disclosures: R. Hurks, None; **I.E. Hoefer,** None; **J.A.V. Herwaarden,** None; **A. Vink,** None; **J.P.D. Vries,** None; **G. Pasterkamp,** None; **F.L. Moll,** None.

PP54.

Minimal Invasive AAA Repair with a Stapled Anastomosis: A Comparison of Techniques

Ralf R Kolvenbach, Sr.[1], Edward Shifrin[2], Misha Witz, Sr.[1], Elisabeth Schwierz, Jr.[1]. [1]Augusta Hospital, Duesseldorf, Germany; [2]Azuta Hospital Tel Aviv, Tel Aviv, Israel

Laparoscopic aortic surgery is only performed in few centers worldwide. The major reason is still the time and expertise required to perform a laparoscopic aortic anastomosis either hand sawn or with a robot. Yet most of these problems can be solved with an aortic stapler.

Objective: To evaluate the performance and safety profile of an aortic stapling device (OAS) in accomplishing a suture less proximal anastomosis in laparoscopic aortic aneurysm repair. The results were compared with three groups of patients who were operated using either a conventional open approach, a mini incision or a total laparoscopic procedure.

Material and Methods: A prospective non randomized study comparing four groups of AAA patients from two vascular units was performed. Patients in the stapler group were followed up for safety evaluation for 12 (twelve) months. Non-parametric tests were used.

Technical Details: The head of the stapler contains a round cassette that is pre-loaded with 10 clips. A transperitoneal laparoscopic aortic approach was used to obtain exposure of the aorta and the renal arteries. A 7 - 8 cm incision was necessary to clamp the aorta, insert the stapler and to perform the distal anastomosis.

Results: A total number of 96 patients were included into the study. Four groups each containing 26 patients were analyzed. An average number of 2 sutures were required in the stapler group. The proximal anastomosis could be performed significantly faster in the stapler group compared to any other treatment technique. This was associated with a decreased total clamping time. Postoperative CT scans showed a regularly stapled anastomosis without any leakage during a follow up period of one year.

Conclusion: For the first time we report the use of an aortic stapler to perform the proximal anastomosis in aortic aneurysm repair. Time to perform the anastomosis and total clamping time were significantly shorter compared to any other laparoscopic or conventional technique. An aortic stapler can greatly facilitate a minimal invasive approach to AAA resection making the procedure easier and more expeditious.

Author Disclosures: R.R. Kolvenbach, None; **E. Shifrin,** Stock options; **M. Witz,** None; **E. Schwierz,** None.

PP55.

Modifiable Predictors of Perioperative Morbidity and Mortality in Open Abdominal Aortic Aneurysm Repair

Gregory J Landry, Ignatius Lau, Timothy K Liem, Erica L Mitchell, Gregory L Moneta. Oregon Health & Science University, Portland, OR

Background: The major advantage of endovascular abdominal aortic aneurysm (AAA) repair over open repair is improved perioperative morbidity/mortality. Long term results of the two modalities are comparable. We sought to quantify factors predicting perioperative morbidity/mortality in patients undergoing open AAA repair.

Methods: Consecutive non-ruptured AAA repairs were analyzed for patient demographic factors, perioperative variables including blood pressure, temperature, and glucose control, complications including wound, bleeding, pulmonary, renal, GI, cerebrovascular and cardiac, and 30-day mortality. Uni- and multivariate analysis was performed to determine predictors of morbidity/mortality.

Results: From 1998-2007 317 AAA repairs were performed. 46% required suprarenal clamping. At least one complication occurred in 45% of cases and 30-day mortality was 5.0%. By stepwise logistic regression analysis, independent predictors of morbidity (any complication) were history of heart disease (OR 1.8, 95%CI 1.1-3.0, p=0.028), suprarenal clamp (OR 2.1, 95%CI 1.3-3.7, p=0.004), and operative time (376±93min. with complication, 329±80min. without, OR 1.006, 95%CI 1.002-1.009, p=0.001). Of potentially modifiable risk factors, low postoperative temperature (35.7±0.8 with complication, 36.0±0.9 without) was significant (OR1.5, 95%CI 1.1-2.0, p=.009). Independent predictors of 30-day mortality were patient age (74±7 with death, 66±16 without, OR 1.11, 95%CI 1.03-1.2, p=0.008) and mean intraoperative systolic blood pressure (113±12 with death, 118±10 without, OR 1.06, 95%CI 1.01-1.12). Glucose control did not predict morbidity or mortality.

Conclusions: Control of postoperative temperature and intraoperative systolic blood pressure are modifiable factors that may potentially reduce morbidity and mortality respectively in patients undergoing open AAA repair.

Author Disclosures: G.J. Landry, None; **I. Lau,** None; **T.K. Liem,** None; **E.L. Mitchell,** None; **G.L. Moneta,** None.

PP56.

Outcomes of Upper and Lower Extremity Arterial Trauma: Review of Over 8,000 Patients from the National Trauma Data Bank

Fernando L Joglar[1], Palma Shaw[1], Robert Eberhardt[1], Denis Rybin[2], Gheorghe Doros[2], Alik Farber[1]. [1]Boston University Medical Center, Boston, MA;[2]Boston University, Biostatistics Department, Boston, MA

Objectives: The purpose of this study is to examine the outcomes in acute arterial traumatic injuries in upper extremities (UE) compared to lower extremities (LE) and blunt compared to penetrating trauma.

Methods: A retrospective review of prospectively collected data from the 2008 version of the National Trauma Data Bank was performed. Using the International Classification of Diseases, Ninth Revision (ICD-9) codes, cases with a diagnosis of arterial vascular injury were identified and procedures were classified according to ICD-9 Clinical Modification codes for vascular therapy. Patients 18 years and older with traumatic blunt or penetrating arterial injury to the extremities were included in the analysis, divided into UE and LE injury groups and then by mechanism of injury, blunt or penetrating. A comparison of demographic information, outcomes, and major amputation rates between groups was performed using Chi-Square, T and Wilcoxon tests.

Results: From 2002-2006, we identified 8,311 extremity arterial injuries among the 1,309,311 patients in the dataset. The patients were 82.7 % male, mean age of 36.2 years, mean Glasgow Coma Scale (GCS) 13.9±3.2 (14.2±2.8 in UE vs. 13.5±3.7 in LE, p<0.0001; 13.7±3.4 in blunt vs. 14±3 in penetrating, p<0.0001) and mean Injury Severity Score (ISS) 10.7±9.8 (8.6±8.3 in UE vs. 14.3±11.1 in LE, p<0.0001; 13.0±11.2 in blunt vs. 9±8 in penetrating, p<0.0001). There were significantly more African Americans in LE group (p<0.0001). See Table.

Conclusions: In the LE group there were significantly more complications, greater mean overall hospital and ICU length of stay and higher mortality. Lower extremities required more intensive intervention compared to upper extremities: there were more fasciotomies, complex soft tissue repairs and major amputations performed. Those patients with blunt mechanism of injury, regardless of the extremity, also had higher rates of these procedures as well as significantly higher complication and mortality rates compared to those with penetrating injury.

Table

Variable	*Overall (n=8311)*	*Upper extremity (n=5260)*	*Lower extremity (n=3051)*	*Test p-value*	*Blunt injury (n=3681)*	*Penetrating injury (n=4630)*	*Test p-value*
Blunt injury (%)	3681 (44.29)	1967 (37.4)	1714 (56.18)	<0.0001			
Penetrating injury (%)	4630 (55.71)	3293 (62.6)	1337 (43.82)				
Complications (%)	844 (10.16)	270 (5.13)	574 (18.81)	<0.0001	505 (13.72)	339 (7.32)	<0.0001
Mean Length of Stay (range)	8.06 (0-158)	5.22 (0-158)	12.97 (0-153)	<0.0001	10.93 (0-134)	5.75 (0-158)	<0.0001
Mean Intensive Care Unit LOS (range)	2.6 (0-99)	1.61 (0-99)	4.1 (0-99)	<0.0001	3.6 (0-90)	1.74 (0-99)	<0.0001
Mortality (%)	350 (4.21)	115 (2.19)	235 (7.7)	<0.0001	175 (4.75)	175 (3.78)	0.03
Fasciotomies (%)	1071 (12.89)	351 (6.67)	720 (23.6)	<0.0001	520 (14.13)	551 (11.9)	0.003
Complex soft tissue repairs (%)	1035 (12.45)	541 (10.29)	494 (16.19)	<0.0001	647 (17.58)	388 (8.38)	<0.0001
Majo r amputations (%)	306 (3.68)	68 (1.29)	238 (7.8)	<0.0001	248 (6.74)	58 (1.25)	<0.0001

Author Disclosures: F.L. Joglar, None; **P. Shaw,** None; **R. Eberhardt,** None; **D. Rybin,** None; **G. Doros,** None; **A. Farber,** None.

PP57.

Comparison of Increases in Sac Volume Versus Maximal Diameter for Preoperative Surveillance of Infrarenal Abdominal Aortic Aneurysms

Feng Qin[1], Thomas Panetta[1], Justin Rafael[1], David Siegel[1], Nicole Johnson[2], Luis Davila-Santini[1], Julio Calderin[1], Lorena DeMarco-Garcia[1], Kambhampaty Krishnasastry[1]. [1]North Shore-LIJ Healthcare System, Lake success, NY; [2]Albert Einstein College of Medicine, Bronx, NY

Objective: To compare sac volume (SV) to maximal diameter (MD) as a surveillance modality in patients with AAA.

Methods: 1011 CTA exams from 375 patients with infrarenal AAA (MD 3.5-5.5cm) undergoing serial CTA follow-up were retrieved from our institute's PACS system from 2003 to 2008. SV constructed by volume rendering as well as MD from traditional axial imaging of each CTA were quantitated. Selective aortic histology from different aneurysmal locations in patients undergoing open aneuryms repair were examined.

Results: Both SV and MD increased faster in larger aneurysms. However, rates of increase in SV were greater than those for MD (Table 1). There were also measurable increases in SV in patients with stable MD. SV in males were greater than those in females (170cm^3 vs. 120cm^3 respectively) in patients with similar MD (average 5.5cm) (Image 1). SV increased more than 50% per year in rapidly expanding AAAs. Although elastin content was degraded most at the MD plane, increases in SV were maximal at locations distinct and different than the MD plane.

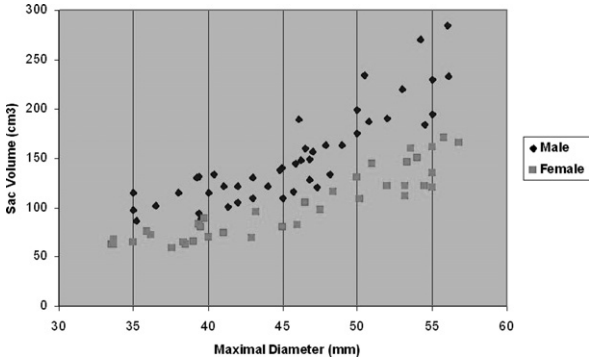
Conclusions: Infrarenal AAAs are less compliant in the plane of MD. Increases in SV provide an additional determination of rupture risk especially in those patients with stable MD. Although risk of rupture of AAAs increases with increasing MD, SV increases at alternate sites may contribute to rupture risk. SV may be a more sensitive modality than MD for surveillance of infrarenal AAAs.

Comparison of increases in sac volume versus maximal diameter

Growth rate of MD (mm/year)	*N=375*	*Growth rate of SV (%/year)*	*p value*
No increasing	92	12.3 ± 3.31	
Moderate increasing (< 10)	208	33.5 ± 7.32	<0.01*
Rapid increasing (> 10)	75	64.7 ± 10.46	<0.01**

*vs. No increasing MD.

**vs. Moderate increasing MD.



Author Disclosures: F. Qin, None; **T. Panetta,** None; **J. Rafael,** None; **D. Siegel,** None; **N. Johnson,** None; **L. Davila-Santini,** None; **J. Calderin,** None; **L. DeMarco-Garcia,** None; **K. Krishnasastry,** None.

PP58.

The Natural History of Moderate Carotid Artery Stenosis: The Timing of Duplex Follow-up in Patients with 50-79% Stenosis

Thomas V Divinagracia, Mary Windels, James Gallagher, Rober Lowe, Mohiuddin Cheema, Amy Mcgee, David Drezner. UConn/ Hartford Hospital, Hartdord, CT

Objective: The purpose of this retrospective study was to investigate the natural history of patients with asymptomatic moderate carotid artery stenosis (50-79%). This was done in an effort to determine how often patients should be followed up with duplex ultrasound.

Methods: From 2002 to 2008, 301 patients and 393 carotid arteries were reviewed and followed to endpoints which included 1.no progression of disease 2.progression of disease without symptoms 3.progression of disease with symptoms 4.new ipsilateral CVA and 5.death. Of note, progression of disease was defined as the degree of stenosis crossing into the severe stenotic range (80-99%). This was achieved through a detailed chart review of the identified patients of one vascular surgical practice.

Results: Duration of follow-up varied for the cohort. Mean length of follow-up was 3.6 years. 311 (79.1%) arteries had no progression of disease, while 82 (21.1%) arteries did have progression of disease. 13 arteries (3.3%) progressed with associated symptoms, while 65 (16.5%) arteries progressed without symptoms, 3 patients (0.76%) suffered a stroke, and 2 (0.51%) died. Further analysis showed that for each year after the moderate stenosis was identified, there was a 2.84% risk of progression into the severe stenosis range. There was a 0.34% chance of going on to occlusion for each year of follow-up, and finally, a 0.26% chance of completing a stroke each year after the 50-79% stenosis was identified.

Conclusions: Based on this data, we reiterate the importance of utilizing routine serial duplex examinations in the prevention of strokes. By monitoring progression of disease, open surgical or endovascular intervention can be appropriately initiated if necessary. It is, however, important to be pragmatic and cost-effective in determining the frequency with which duplex surveillance is used. With this in mind, we feel that for patients with asymptomatic moderate carotid artery stenosis (50-79%), consideration should be given to lengthening the interval between follow-up scans (likely 12 months or greater). This is based on our findings of a relatively low annual percent chance of disease progression, stroke, and mortality in this cohort of patients.

Author Disclosures: T.V. Divinagracia, None; **M. Windels,** None; **J. Gallagher,** None; **R. Lowe,** None; **M. Cheema,** None; **A. Mcgee,** None; **D. Drezner,** None.

PP59.

Ring-Stent Supported Infrarenal Aortic Endograft Fit Well in Abdominal Aortic Aneurysms with Tortuous Anatomy

Antonio Freyrie, Gianluca Faggioli, Mauro Gargiulo, Gabriele Testi, Federica Giovanetti, Filippo Maioli, Andrea Stella. University of Bologna, Bologna, Italy

Background: Abdominal aortic aneurysms (AAA) with severe angulation of the neck or of the iliac arteries are often unsuitable for endovascularrepair with conventional endograft because of the rigidity of most devices. We have therefore evaluated the performance of a ring-stent abdominal endograft in a consecutive series of infrarenal AAA.

Methods: Preoperative, procedural and follow-up data of patients treated with a ring-stent abdominal endograft (Anaconda Vascutek,